

(19)日本国特許庁 (JP)

## (12) 公開特許公報 (A)

(11)特許出願公開番号

特開2002-116560

(P2002-116560A)

(43)公開日 平成14年4月19日 (2002.4.19)

(51) Int.Cl.<sup>7</sup>  
 G 0 3 G 5/05 1 0 1  
 5/06 3 1 3  
 3 1 4  
 3 7 1

F I  
 G 0 3 G 5/05 1 0 1 2 H 0 6 8  
 5/06 3 1 3  
 3 1 4  
 3 7 1

審査請求 有 請求項の数10 O.L. (全 11 頁)

(21)出願番号 特願2000-310967(P2000-310967)

(71)出願人 000006150

京セラミタ株式会社

(22)出願日 平成12年10月11日 (2000.10.11)

大阪府大阪市中央区玉造1丁目2番28号

(72)発明者 東 清

大阪市中央区玉造1丁目2番28号 京セラ

ミタ株式会社内

(72)発明者 追 裕之

大阪市中央区玉造1丁目2番28号 京セラ

ミタ株式会社内

(72)発明者 渡辺 征正

大阪市中央区玉造1丁目2番28号 京セラ

ミタ株式会社内

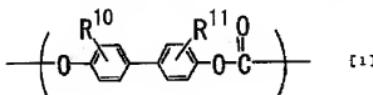
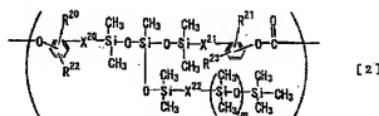
最終頁に続く

(54)【発明の名称】 湿式現像方式の画像形成装置に使用される電子写真感光体

(57)【要約】 (修正有)

【課題】湿式画像形成装置の現像液に使用される、アイソバーと呼ばれる脂肪族系炭化水素や、パラフィン系溶媒、等の炭化水素系溶媒に浸漬させてても、耐溶媒性に優れ、かつ実用感度を有する電子写真感光体を提供する。

【解決手段】導電性基体上に、電荷発生剤と、電荷輸送剤を含有するバインダー樹脂からなる感光層を備え、前記バインダー樹脂が、一般式〔1〕または一般式〔2〕で示される繰返し構造単位のポリカーボネート樹脂を含有し、且つ、炭化水素系溶媒中にトナー粒子が分散した現像溶液を用いた湿式現像方式の画像形成装置に使用されることを特徴とした電子写真感光体。

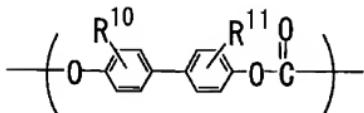


(一般式〔1〕中、R<sup>10</sup>、R<sup>11</sup>は、同一または異なつて、水素原子または炭素数1～3のアルキル基を示

【特許請求の範囲】

【請求項 1】導電性基体上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバインダー樹脂からなる感光層を備え、前記バインダー樹脂が、一般式〔1〕で示される繰返し構造単位を有するポリカーボネート樹脂を含有し、且つ、炭化水素系溶媒中にトナー粒子が分散した現像溶液を用いた湿式現像方式の画像形成装置に使用されることを特徴とした電子写真感光体。一般式〔1〕：

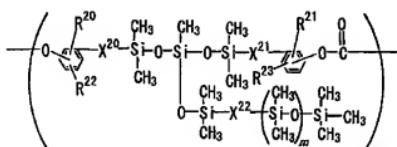
【化1】



(一般式〔1〕中、R<sup>10</sup>、R<sup>11</sup>は、同一または異なって、水素原子または炭素数1～3のアルキル基を示す。)

【請求項 2】導電性基体上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバインダー樹脂からなる感光層を備え、前記バインダー樹脂が、一般式〔1〕で示される繰返し構造単位と一般式〔2〕で示される構造単位を有するポリカーボネート樹脂を含有し、且つ、炭化水素系溶媒中にトナー粒子が分散した現像溶液を用いた湿式現像方式の画像形成装置に使用されることを特徴とした電子写真感光体。一般式〔2〕：

【化2】



〔1〕で示される繰返し構造単位を10～50mol%含有することを特徴とする請求項1または2記載の電子写真感光体。

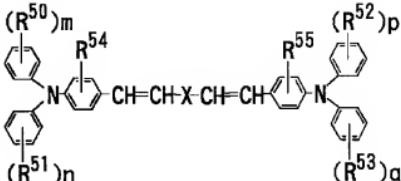
【請求項 5】前記バインダー樹脂総量に対して、一般式〔2〕で示される繰返し構造単位を0.05～10mol%含有することを特徴とする請求項2記載の電子写真感光体。

【請求項 6】前記感光層が、少なくとも電荷発生剤と、電荷輸送剤としてホール輸送剤と電子輸送剤と共に含有する単層型であることを特徴とする請求項1または2記載の電子写真感光体。

【請求項 7】前記電荷輸送剤が一般式〔4〕で示されるホール輸送剤を含有し、前記電荷輸送剤の固形分濃度が全固形分濃度の50wt%以下であることを特徴とする請求項1または2または6記載の電子写真感光体。

一般式〔5〕：

【化5】



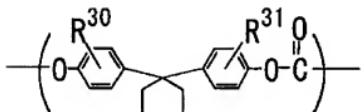
(一般式〔5〕中、R<sup>50</sup>、R<sup>51</sup>、R<sup>52</sup>及びR<sup>53</sup>は同一または異なって、アルキル基、アルコキシ基、アリール基、アラルキル基、またはハロゲン原子を示し、m、n、p及びqは同一または異なって0～3の整数を示す。)

(一般式〔2〕中、X<sup>20</sup>、X<sup>21</sup>、X<sup>22</sup>は、同一または異なって-(CH<sub>2</sub>)<sub>n</sub>で、nは1～6の整数を示し、R<sup>20</sup>、R<sup>21</sup>、R<sup>22</sup>、R<sup>23</sup>は、同一または異なって、水素原子、フェニル基、炭素数1～3のアルキル基またはアルコキシ基を示し、mは0～200の数値を示す。)

【請求項 3】前記バインダー樹脂が、一般式〔3〕または一般式〔4〕で示される繰返し構造単位のポリカーボネート樹脂を含有することを特徴とする請求項1または2記載の電子写真感光体。

一般式〔3〕：

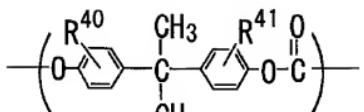
【化3】



(一般式〔3〕中、R<sup>30</sup>、R<sup>31</sup>は、同一または異なって、水素原子または炭素数1～3のアルキル基を示す。)

一般式〔4〕：

【化4】



(一般式〔4〕中、R<sup>40</sup>、R<sup>41</sup>は、同一または異なって、水素原子または炭素数1～3のアルキル基を示す。)

はアルキル基を示す。また、 $-X-$ は  
【化6】



または  
【化7】



を示す。)

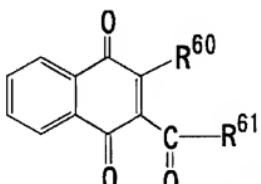
【請求項8】前記電荷発生剤が、フタロシアニン系顔料を含有することを特徴とする請求項1または2または6記載の電子写真感光体。

【請求項9】前記電荷輸送剤中のホール輸送剤の総重量が、電子輸送剤の総重量と同等以下であることを特徴とする請求項6記載の単層型電子写真感光体。

【請求項10】前記電子輸送剤が、一般式【6】で示される化合物を含有することを特徴とする請求項6記載の単層型電子写真感光体。

一般式【6】：

【化8】



(一般式【6】中、 $R^{60}$ はハログン原子、置換基を有してもよい、アルキル基またはアリール基を示し、 $R^{61}$ は置換基を有してもよい、アルキル基またはアリール基、または基： $-O-O-R^{61a}$ を示す。 $R^{61a}$ は、置換基を有してもよい、アルキル基またはアリール基を示す。)

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、電子写真式複写機、ファクシミリ、レーザービームプリンタ等の湿式現像方式の画像形成装置に用いられる電子写真感光体に関するものである。より詳細には、炭化水素系溶媒中にトナー粒子が分散した湿式現像方式の画像形成装置に使用可能な有機感光体に関するものである。

【0002】

【従来の技術】カールソンプロセスを利用した電子写真現像方式は、乾式現像方式と湿式現像方式に大別される。乾式現像方式を用いた画像形成装置は、複写機、プリンタ等、現在広く一般的に使用されているが、湿式現像方式を用いた画像形成装置は、古くから開発、製品化

【0003】しかしながら、湿式現像方式を利用した画像形成装置は、一般に、炭化水素系溶媒中にトナーが分散しており、トナー粒径を  $1 \mu m$  以下にまですることが可能であるため、得られる画像は非常に高画質となる。このため、近年の高画質が求められるフルカラープリンターの市場拡大にともない、再び脚光を浴びつつあり、開発が進められている。

【0004】湿式現像方式を利用した画像形成装置は、前述のように炭化水素系溶媒を現像溶液として使用するため、感光体ドラムの全部または一部が、前記炭化水素系溶媒中に浸漬される。炭化水素系溶媒としては、例えば、アイソパーコールと呼ばれる脂肪族系炭化水素や、パラフィン系溶媒、等が挙げられる。そして、これらの炭化水素系溶媒中に感光層成分が溶出しないセレン、アモルファスシリコン等の無機感光体が使用されるのが一般的である。

【0005】一方、有機感光体は、従来の無機感光体に比べて製造が容易でありコストが安く、また、電荷輸送剤、電荷発生剤、結着樹脂等の感光体材料の選択肢が多様で機能設計の自由度が高く、毒性が無いという利点を有することから、近年、前記の無機感光体よりも広く用いられている。

【0006】有機感光体には、電荷輸送剤（ホール輸送剤または電子輸送剤）を電荷発生剤とともに同一の感光層中に分散させた単層型感光体と、電荷発生剤を含有する電荷発生層と電荷輸送剤を含有する電荷輸送層とを積層した積層型感光体がある。

【0007】特に、構造が簡単で製造が容易であること、層を形成する際の皮膜欠陥を抑制できること、層間の界面が少なく、光学的特性を向上できること等により、単層型感光体が脚光を浴びている。

【0008】前記積層型感光体、単層型感光体は正負いずれの帯電型にも使用することができるが、層構成の順序、及び感光体構成材料の特性等の理由により、一般的に、積層型は負帯電、単層型は正帯電で使用するのが主流となっている。

【0009】このため、前記湿式現像方式を利用した画像形成装置に一般的に使用されているセレン、アモルファスシリコン等の無機感光体は、通常正帯電型で使用されるため、従来使用されていた無機感光体を、コストが安く毒性の無い有機感光体に置き換える場合においては、単層型有機感光体が同じ正帯電型であるため有利となる。

【0010】

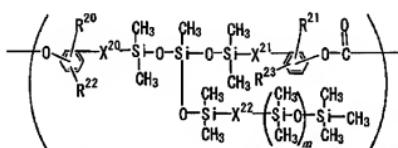
【発明が解決しようとする課題】一般的な有機感光体を、湿式現像方式を利用した画像形成装置に使用する場合、前述のように感光体ドラムの全部または一部が炭化水素系溶媒中に浸漬されるため、感光体表面にヒビ割れ等の外観変化が発生し、電荷輸送剤（ホール輸送剤または電

し、帯電が低下したり、感度が悪化するといった現象が発生し、良好な画像が得られ難くなる。

【0011】そこで、有機感光体の表面にさらにシリコン樹脂、メラミン樹脂、エポキシ樹脂等の熱硬化性樹脂でオーバーコート（表面保護層）を施した有機感光体を使用することにより、前述のアイソパーと呼ばれる脂肪族系炭化水素や、パラフィン系溶媒、等の炭化水素系溶媒に対する耐久性（以下、「耐溶媒性」と略記する）が発現し、電荷輸送剤の溶出を防ぐことが提案されている。しかし、オーバーコートを施すことにより感度が著しく悪化し、また製造コストが高くなるという大きな問題が新たに生じる。

【0012】一方、オーバーコートを施さない方法としては、バイNDER樹脂自体に電荷輸送能を付与（電荷輸送ポリマー）し、電荷輸送剤の含有率をゼロ、もしくは減少させることにより、耐溶媒性を発現させることが提案されているが、電荷輸送ポリマーの分子設計は非常に困難で、電子写真感光体としての実用感度にはほど遠い。

【0013】そこで、本発明の目的は、オーバーコートを施さないで、炭化水素系溶媒に浸漬させても、「耐溶媒性に優れ」（感光体表面の外観変化がなく、電荷輸送剤の炭化水素系溶媒中の溶出が極めて少ない）、かつ実用感度を有する電子写真感光体を提供することである。

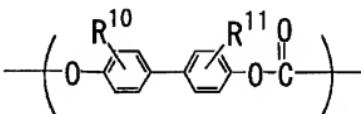


#### 【0014】

【課題を解決するための手段】本発明者らは銳意研究の結果、上記目的を達成するために、導電性基体上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバイNDER樹脂からなる感光層を備え、前記バイNDER樹脂が、一般式【1】または一般式【2】で示される繰返し構造単位を有するポリカーボネート樹脂を含有した電子写真感光体が、炭化水素系溶媒中にトナー粒子が分散した現像溶液を用いた湿式現像方式の画像形成装置に使用しても、耐溶媒性が極めて良好で、含有している電荷輸送剤（ホール輸送剤または電子輸送剤）が炭化水素系溶媒中に溶出し難く、良好な画像が得られる事実を見出した。

#### 【0015】一般式【1】：

【化9】



（一般式【1】中、R<sup>10</sup>、R<sup>11</sup>は、同一または異なって、水素原子または炭素数1～3のアルキル基を示す。）

#### 【0016】一般式【2】：

【化10】

（一般式【2】中、X<sup>20</sup>、X<sup>21</sup>、X<sup>22</sup>は、同一または異なって-(CH<sub>n</sub>)-で、nは1～6の整数を示し、R<sup>20</sup>、R<sup>21</sup>、R<sup>22</sup>、R<sup>23</sup>は、同一または異なって、水素原子、フェニル基、炭素数1～3のアルキル基またはアルコキシ基を示し、mは0～200の数値を示す。）

【発明の詳細な説明】

#### 【00017】

【本発明の作用】本発明の電子写真感光体は、炭化水素系溶媒中にトナー粒子が分散した現像溶液を用いた湿式画像形成装置に使用され、導電性基体上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバイNDER樹脂からなる感光層を備え、前記バイNDER樹脂が、一般式【1】または一般式【2】で示される繰返し構造単位のポリカーボネート樹脂を含有することを特徴とする。

【0018】一般式【1】または一般式【2】で示される繰返し構造単位を有するポリカーボネート樹脂は、前述の炭化水素系溶媒に対して難溶であるとともに、前記炭化水素系溶媒に対する撥油性も高い。その結果、感光

り、感光層表面の外観変化がなく、電荷輸送剤が前記炭化水素系溶媒中に溶出し難くなると推測される。

#### 【0019】

【発明の実施形態】本発明の電子写真感光体は、アイソパーと呼ばれる脂肪族系炭化水素や、パラフィン系溶媒、等の炭化水素系溶媒を用いた湿式画像形成装置に使用され、少なくとも電荷発生剤と、電荷輸送剤を含有するバイNDER樹脂からなる感光層を備え、前記バイNDER樹脂が、一般式【1】または一般式【2】で示される繰返し構造単位のポリカーボネート樹脂を含有する限り、任意の感光体であってよく、電荷発生剤と電荷輸送剤を単一感光層中に含有する単層型感光体であってもよく、また、電荷発生層と電荷輸送層とを積層した積層型感光体であってもよい。

【0020】前述のように、本発明の電子写真感光体は、単層型の場合、電荷輸送剤としてホール輸送剤と電子輸送剤を併用することが好ましいが、通常、電子輸送剤の移動度がホール輸送剤の移動度より小さいため正帶

層型の場合は、電荷発生層の上に、ホール輸送剤を含有した電荷輸送層を積層した負帯電型で使用することが好ましい。

【0021】[バインダー樹脂] 請求項1または2に記載のように、本発明の電子写真感光体に使用されるバインダー樹脂は、一般式[1]または一般式[2]で示される繰返し構造単位のポリカーボネート樹脂を含有する。

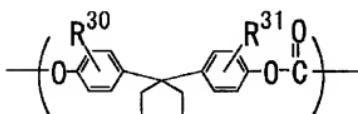
【0022】また、本発明の電子写真感光体に使用されるバインダー樹脂は、少なくとも前記ポリカーボネート樹脂を含有すればよく、他に、従来から感光層に使用されている種々の樹脂を使用することができます。

【0023】例えば、ビスフェノールZ型、ビスフェノールZC型、ビスフェノールC型、ビスフェノールA型等のポリカーボネート樹脂、ポリアクリレート樹脂を始め、ステレンーパタジエン共重合体、ステレンーアクリロニトリル共重合体、ステレンーマレイン酸共重合体、アクリル共重合体、ステレンーアクリル酸共重合体、ポリエチレン、エチレンー酢酸ビニル共重合体、塩素化ポリエチレン、ポリ塩化ビニル、ポリプロピレン、アイオノマー、塩化ビニルー酢酸ビニル共重合体、アルキド樹脂、ポリアミド、ポリウレタン、ポリスルホン、ジアリルフタレート樹脂、ケトン樹脂、ポリビニルブチラール樹脂、ポリエーテル樹脂等の熱可塑性樹脂、シリコーン樹脂、エポキシ樹脂、フェノール樹脂、尿素樹脂、メラミン樹脂、その他架橋性の熱硬化性樹脂、エポキシアクリレート、ウレタンーアクリレート等の光硬化型樹脂等の樹脂が使用可能である。

【0024】請求項3記載のように、前記バインダー樹脂が、一般式[1]または一般式[2]で示される繰返し構造単位と、一般式[3]または一般式[4]で示される繰返し構造単位を有するポリカーボネート樹脂を含有する場合に、特に、感光体の耐溶媒性または感度向上に有効である。

【0025】一般式[3]：

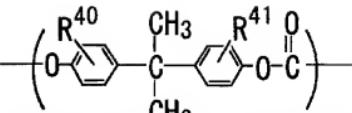
【化11】



(一般式[3]中、R<sup>30</sup>、R<sup>31</sup>は、同一または異なって、水素原子または炭素数1～3のアルキル基を示す。)

【0026】一般式[4]：

【化12】



(一般式[4]中、R<sup>40</sup>、R<sup>41</sup>は、同一または異なって、水素原子または炭素数1～3のアルキル基を示す。)

【0027】これは、一般式[1]または一般式[2]で示される繰返し構造単位を有するポリカーボネート樹脂は、前述のように、炭化水素系溶媒に対して難溶性であるため耐溶媒性には優れるが、電荷輸送剤との相溶性に劣る。これに対して、一般式[3]または一般式

[4]で示される繰返し構造単位を有するポリカーボネート樹脂は電荷輸送剤との相溶性が良好である。このため、一般式[1]または一般式[2]で示される繰返し構造単位を有するポリカーボネート樹脂と、一般式

[3]または一般式[4]で示される繰返し構造単位のポリカーボネート樹脂を使用することにより、電荷輸送剤が、バインダー樹脂中において分子分散し易くなり、下記の理由により、感光体の耐溶媒性または感度が向上すると考えられる。

【0028】上記のように、バインダー樹脂と電荷輸送剤との相溶性が、耐溶媒性や感度に大きな影響を及ぼす理由としては、電荷輸送剤は、通常、バインダー樹脂中に均一溶解し分子分散しているが、バインダー樹脂と電荷輸送剤との相溶性が悪いと、バインダー樹脂分子と電荷輸送剤分子との相互作用が弱くなり、電荷輸送剤分子が炭化水素系溶媒中に溶出し易くなつて耐溶媒性が低下するとともに、電荷輸送剤分子が凝集し易くなり、電荷の授受効率が低下し感度が悪化すると推測される。

【0029】特に、単層型感光体においては、電荷輸送剤として、ホール輸送剤と電子輸送剤を併用して含有させることができが好ましく、バインダー樹脂に対する電荷輸送剤総量の含有比が大きくなる。更には、電荷発生剤も電荷輸送剤と同一感光層中に粒子分散して存在している。すなわち、単層型感光体においては、積層型感光体と比較して、バインダー樹脂中に分散または溶解している材料が多く、特に、バインダー樹脂と電荷輸送剤との相溶性が、感光体の耐溶媒性または感度に及ぼす影響は非常に大きくなる。

【0030】また、請求項4または5記載のように、バインダー樹脂総量に対して、一般式[1]で示される繰返し構造単位は10～50mol%、一般式[2]で示される繰返し構造単位は0.05～1.0mol%含有することが好ましい。一般式[1]で示される繰返し構造単位の含有量が5.0mol%より多くなると、前記のように電荷輸送剤との相溶性が低下することにより耐溶媒性や感度が悪化し、1.0mol%より少ないと耐溶媒性

繰返し構造単位の含有量が 1.0 mol % より多くなると、前記と同様の理由により、感光体の耐溶媒性や感度が悪くなり、0.05 mol % より少ないと耐溶媒性が悪化する傾向にある。

【0031】上記のバインダー樹脂は、単独または 2 種以上をブレンドまたは共重合して使用できる。本発明の電子写真感光体に使用されるバインダー樹脂の重量平均分子量は 1,000 ~ 4,000,000、更には 30,000 ~ 200,000 が好ましい。

【0032】【電荷発生剤】本発明の電子写真感光体に使用される電荷発生剤としては、例えば、無金属フタロシアニン、オキソチタニルフタロシアニン等のフタロシアニン系顔料、ペリレン系顔料、ビスマス系顔料、ジオケトビロビロール顔料、無金属ナフタロシアニン顔料、金属ナフタロシアニン顔料、スクアライン顔料、トリスアゾ顔料、インジゴ顔料、アズレニウム顔料、シアニン顔料、ビリウム顔料、アンサンスロン顔料、トリフェニルメタン系顔料、スレン顔料、トルイジン系顔料、ビラゾリン系顔料、キナクリドン系顔料といった有機光導電体や、セレン、セレンーテルル、セレンーヒ素、硫化カドミウム、アモルファスシリコンといった無機光導電材料等の、従来公知の電荷発生剤が挙げられる。

【0033】上記例示の電荷発生剤は、所望の領域に吸収波長を有するように、単独または 2 種以上をブレンドして使用できる。

【0034】上記例示の電荷発生剤のうち、特に半導体レーザー等の光源を使用したレーザービームプリンタやファクシミリ等のデジタル光学系の画像形成装置には、700 nm 以上の波長領域に感度を有する感光体が必要となるため、請求項 8 記載のように、例えば無金属フタロシアニン、オキソチタニルフタロシアニン等のフタロシアニン系顔料が好適に使用される。なお、上記フタロシアニン系顔料の結晶型については特に限定されず、種々のものを使用できる。

【0035】单層型感光体の場合、電荷発生剤は全バインダー樹脂重量に対して 0.1 ~ 5.0 wt %、更には 0.5 ~ 3.0 wt % 含有させることが好ましい。積層型感光体の場合、1 ~ 5.00 wt %、更には 1.0 ~ 3.00 wt % 含有させることが好ましい。

【0036】【電荷輸送剤】本発明の電子写真感光体に使用される電荷輸送剤は、従来公知の電子輸送剤またはホール輸送剤を使用することができる。特に、单層型感光体の場合は、感光層中に電子輸送剤とホール輸送剤をブレンドして含有させることが好ましい。

【0037】<ホール輸送剤>本発明の電子写真感光体に使用可能なホール輸送剤としては、例えば N, N, N', N' - テトラフェニルベンジジン誘導体、N, N, N', N' - テトラフェニルフェニレンジアミン誘導体、N, N, N', N' - テトラフェニルナフチレン

フェナントリエンジアミン誘導体、2, 5-ジ(4-メチルアミノフェニル)-1, 3, 4-オキサジアゾール等のオキサジアゾール系化合物、9-(4-ジエチルアミノスチリル)アントラセン等のスチリル系化合物、ボリビニルカルバゾール等のカルバゾール系化合物、有機ボリシラン化合物、1-フェニル-3-(p-ジメチルアミノフェニル)ビラゾリン等のビラゾリン系化合物、ヒドラゾン系化合物、インドール系化合物、オキサゾール系化合物、イソオキサゾール系化合物、チアゾール系化合物、チアジアゾール系化合物、イミダゾール系化合物、ビラゾール系化合物、トリアゾール系化合物等の含窒素環式化合物や、縮合多環式化合物が挙げられる。

【0038】本発明において、ホール輸送剤は 1 種のみを使用する他、2 種以上をブレンドして使用してもよい。

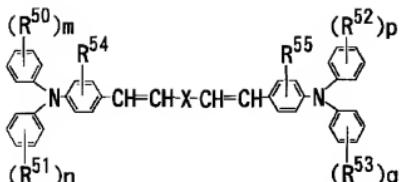
【0039】<電子輸送剤>本発明の電子写真感光体に使用可能な電子輸送剤としては、ジフェノキノン誘導体、ベンゾキノン誘導体のほか、アントラキノン誘導体、マロノニトリル誘導体、オビラン誘導体、トリニトロチオキサントン誘導体、3, 4, 5, 7-テトラニトロ-9-フルオレノン誘導体、ジニトロアントラセン誘導体、ジニトロアクリジン誘導体、ニトロアントラキノン誘導体、ジニトロアントラキノン誘導体、テトラシアノエチレン、2, 4, 8-トリニトロチオキサントン、ジニトロベンゼン、ジニトロアントラセン、ジニトロアクリジン、ニトロアントラキノン、ジニトロアントラキノン、無水カハク酸、無水マレイン酸、ジプロモ無水マレイン酸等の、電子受容性を有する種々の化合物が挙げられる。

【0040】本発明において、電子輸送剤は 1 種のみを使用する他、2 種以上をブレンドして使用してもよい。

【0041】一般的に電荷輸送剤の含有量が多いほど、感光体の光感度は良好となるが、感光体表面近傍に存在する電荷輸送剤の割合も高くなるため、現像液として使用され、感光体ドラムの全部または一部が浸漬されている炭化水素系溶媒中へ、電荷輸送剤が溶出し易くなり耐溶媒性が低下する。反対に、電荷輸送剤の含有量が少ないほど、光感度は悪化するが、耐溶媒性は向上する。このため、請求項 7 記載のように、全電荷輸送剤の固形分濃度を全固形分濃度の 5.0 wt % 以下にすることが好ましい。

【0042】特に、請求項 7 記載の一般式 [5] で示されるスチルベン系誘導体は、ホール輸送剤として、移動度が大きいため、比較的少ない含有量でも十分な光感度が発現する。すなわち、一般式 [5] で示されるホール輸送剤を含有する電荷輸送剤の固形分濃度を全固形分濃度の 5.0 wt % 以下にすることで、前記炭化水素系溶媒中への溶出が極めて少なく、且つ、実使用上問題の無い光感度を有する感光体が得ることができる。

【化13】



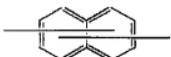
(一般式 [5] 中、R<sup>50</sup>、R<sup>51</sup>、R<sup>52</sup>及びR<sup>53</sup>は同一または異なって、アルキル基、アルコキシ基、アリール基、アラルキル基、またはハロゲン原子を示し、m、n、p及びqは同一または異なって0~3の整数を示す。R<sup>54</sup>及びR<sup>55</sup>は同一または異なって、水素原子またはアルキル基を示す。また、-X-は

【化14】



または

【化15】



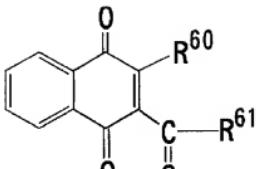
を示す。)

【0044】一方、請求項9記載のように、単層型感光体の場合に限っては、ホール輸送剤の含有量は電子輸送剤の含有量の同等以下であることが好ましい。これは、ホール輸送剤と電子輸送剤は電荷輸送錫体（CTコンプレックス）を形成する場合が多く、CTコンプレックスは前記炭化水素系溶媒に対して難溶であり、CTコンプレックスを形成しない余剰なホール輸送剤は炭化水素系溶媒中に溶出し易いためと考えられる。

【0045】特に、電子輸送剤として請求項10記載の一般式[6]で示される化合物が好適に使用される。これは、一般式[5]で示されるホール輸送剤と一般式[6]で示される電子輸送剤とはCTコンプレックスを形成し易い組み合わせであり、該CTコンプレックスが前述のように炭化水素系溶媒に対して難溶であるためと推測される。

【0046】一般式[6]：

【化16】



(一般式[6]中、R<sup>60</sup>はハロゲン原子、置換基を有してもよい、アルキル基またはアリール基を示し、R<sup>61</sup>は置換基を有してもよい、アルキル基またはアリール基、または基：-O-R<sup>61a</sup>を示す。R<sup>61a</sup>は、置換基を有してもよい、アルキル基またはアリール基を示す。)

【0047】以上より、電荷輸送剤として、一般式[5]で示されるホール輸送剤と一般式[6]で示される電子輸送剤を含有し、前記電荷輸送剤の固形分濃度が全固形分濃度の50wt%以下であり、前記ホール輸送剤の総重量が前記電子輸送剤の総重量と同等以下である場合に、耐溶媒性が最高で、また高感度を有する単層型感光体を得ることができる。

【0048】単層型感光体の場合、感光層膜厚は5~100μm、更には10~50μm程度が好ましい。積層型感光体の場合、電荷発生層の膜厚0.01~5μm、更には0.1~3μmが好ましく、電荷輸送層の膜厚は2~100μm、更には5~50μm程度が好ましい。

【0049】感光層には、前述の各成分のほかに、電子写真特性に悪影響を与えない範囲で、従来公知の種々の添加剤、例えば、酸化防止剤、ラジカル捕捉剤、一重項ケンチャーや、紫外線吸収剤等の劣化防止剤、軟化剤、可塑剤、表面改質剤、增量剤、増粘剤、分散安定剤、ワックス、アクセプター、ドナー等を配合することができる。また、感光層の感度を向上させるために、例えば、テルフェニル、ハロナフトキノン類、アセナフチレン等の公知の感増剤を電荷発生剤と併用してもよい。

【0050】支持体と感光層、または積層された層間に、感光体の特性を阻害しない範囲でパリア層が形成されてもよい。

【0051】感光層が形成される支持体としては、導電性を有する種々の材料を使用することができ、例えば、鉄、アルミニウム、銅、スズ、白金、銀、バナジウム、モリブデン、クロム、カドミウム、チタン、ニッケル、パラジウム、インジウム、ステンレス鋼、真鍮等の金属単体や、上記金属が蒸着またはラミネートされたプラスチック材料、ヨウ化アルミニウム、酸化スズ、酸化インジウム等で被覆されたガラス等があげられる。

【0052】支持体の形状は、使用する画像形成装置の構造に合わせて、シート状、ドラム状等のいずれであってもよく、支持体自体が導電性を有するか、あるいは支持体の表面が導電性を有していればよい。また、支持体は使用に際して十分な機械的強度を有するものが好ましい。

【0053】感光層を塗布の方法により形成する場合には、前記例示の電荷発生剤、電荷輸送剤、バインダー樹脂等を適当な溶剤とともに、公知の方法、例えば、ローラミル、ボールミル、アトライタ、ペイントシェーカー、超音波分散機等を用いて分散混合して分散液を調整し、これを公知の手段により塗布して乾燥させればよ

【0054】上記分散液を作製するための溶剤としては、種々の有機溶剤が使用可能であり、例えば、メタノール、エタノール、イソプロパノール、ブタノール等のアルコール類、n-ヘキサン、オクタン、シクロヘキサン等の脂肪族系炭化水素、ベンゼン、トルエン、キシレン等の芳香族系炭化水素、ジクロロメタン、ジクロロエタン、クロロホルム、四塩化炭素、クロロベンゼン等のハロゲン化炭化水素、ジメチルエーテル、ジエチルエーテル、テトラヒドロフラン、エチレンギリコールジメチルエーテル、ジエチレングリコールジメチルエーテル等のエーテル類、アセトン、メチルエチルケトン、シクロヘキサン等のケトン類、酢酸エチル、酢酸メチル等のエステル類、ジメチルホルムアルドヒド、ジメチルホルムアミド、ジメチルスルホキシド等があげられる。これらの溶剤は単独で、または2種以上混合して用いられる。

【0055】さらに、電荷発生剤、電荷輸送剤等の分散性、感光層表面の平滑性を良くするために、界面活性剤、レベリング剤等を使用してもよい。

#### 【0056】

【発明の実施形態】以下、実施例および比較例をあげて本発明を説明する。なお、以下の実施形態は本発明を具体化した一例であって、本発明の技術的範囲を限定するものではない。

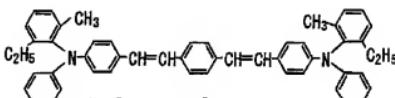
【0057】【実施例1～19】電荷発生剤としてX型無金属フタロシアニン3.5重量部、ホール輸送剤とし

てHTM-1～5から選択された1種(3.5～7.5重量部)、電子輸送剤としてETM-1、-2から選択された1種(5.5重量部)、ペインダー樹脂として重量平均分子量1000,000の、一般式[1]または一般式[2]で示される繰返し構造単位と、ビスフェノールZ型ポリカーボネート、またはビスフェノールA型ポリカーボネートの共重合ポリカーボネート樹脂(Resin-1～-3)110重量部を、テトラヒドロフラン400重量部とともにポールミル中で24時間分散あるいは溶解させ、単層型感光層用塗布液を作製した(全固形分濃度に対する電荷輸送剤固形分濃度:4.4.2～5.3.4wt%)。

【0058】【比較例1～5】ペインダー樹脂として、重量平均分子量1000,000のビスフェノールZ型ポリカーボネート樹脂(Resin-4)を使用した以外は、実施例と同様にして単層型感光体用塗布液を作製した。

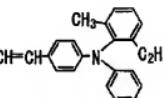
#### 【0059】【HTM-1】

#### 【化17】

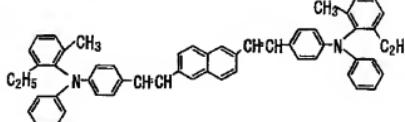


【0060】【HTM-2】

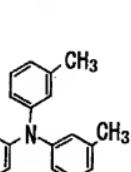
#### 【化18】



【化19】

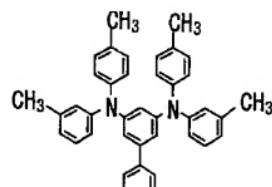


【0061】【HTM-3】



【0062】【HTM-4】

#### 【化20】

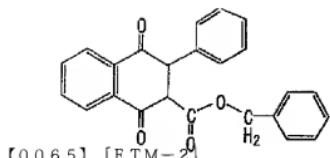


【0063】【HTM-5】

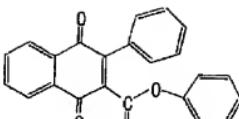
#### 【化21】

【0064】【ETM-1】

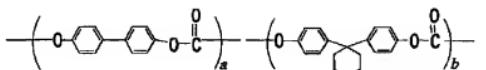
#### 【化22】



【0065】[ETM-2]  
【化23】

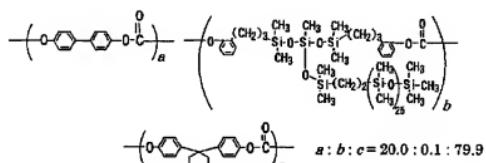


【0066】[Resin-1]  
【化24】



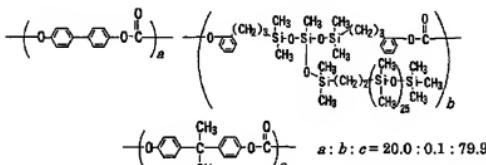
【0067】[Resin-2]

$a:b = 20.0:80.0$



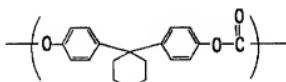
【0068】[Resin-3]

【化26】



【0069】[Resin-4]

【化27】



【0070】上記各実例、比較例の感光体について、下記の試験により耐溶媒性を評価した。

【0071】<耐溶媒性試験>実例、比較例で得られた塗布液を使用して、アルミ蒸着シート上に膜厚2.5μmの単層型感光層を作製し(熱処理条件125℃、3.5分)、5cm×5cmの試験片を得た。次に、上記試験片を100gのアイソパーH(湿式画像形成装置の現像液に使用される脂肪族系炭化水素)中に密閉して、暗所、50℃で1週間浸漬させた。一方、ホール輸送剤及び電子輸送剤を所定濃度にてアイソパーH中に強制溶解させ、UV測定により、前記ホール輸送剤と電子輸送剤のピーク波長での、濃度-吸光度検量線を作製した。そして、試験片を浸漬したアイソパーHのUV測定を行い、前記検量線を用いてホール輸送剤及び電子輸送剤のピーク波長での吸光度から、溶出量を算出した。溶出量

が少ないほど感光体の耐溶媒性は高い。

【0072】ホール輸送剤溶出量については $0.5 \times 10^{-3}$ mol/l以下を可、電子輸送剤溶出量については $3 \times 10^{-3}$ mol/l以下を可とした。特に、ホール輸送剤溶出量については $0.25 \times 10^{-3}$ mol/l以下、電子輸送剤溶出量については $2 \times 10^{-3}$ mol/l以下が好ましい。

【0073】感光体表面の外観変化は、上記試験片をアイソパーHに、50℃、暗所にて3週間浸漬させ、取り出した後、アイソパーHを自然乾燥させ、感光体表面を目視により観察した。

【0074】感光層表面に変化が無い場合を○、少しのヒビ割れが発生した場合を△、試験片の全面にヒビ割れが発生した場合を×とした。なお、外観変化は過酷な浸漬試験により評価しているため、前記評価が△であっても、例えば、感光体ドラムの一部が現像溶液に浸漬している湿式画像形成装置に使用するのであれば実使用上の問題は無い。

【0075】表1に、上記評価試験結果を示した。

【0076】

【表1】

	ホール輸送剤 種類	ホール輸送剤 含有量(重量%)	電子輸送剤 種類(55重量部)	電荷輸送剤混合比率(%)	バイインダー樹脂 種類	HTM溶出量 $\times 10^{-3}$ (mol/L)	ETM溶出量 $\times 10^{-3}$ (mol/L)	感光体表面 外観変化
実施例1	HTM-1	45	ETM-1	46.8	Resin-1	0.203	1.895	○
実施例2	HTM-2	45	ETM-1	46.8	Resin-1	0.205	1.901	○
実施例3	HTM-3	45	ETM-1	46.8	Resin-1	0.233	1.923	○
実施例4	HTM-4	45	ETM-1	46.8	Resin-1	0.485	2.358	△
実施例5	HTM-5	45	ETM-1	46.8	Resin-1	0.485	2.598	△
実施例6	HTM-1	45	ETM-2	46.8	Resin-2	0.212	1.944	○
実施例7	HTM-2	45	ETM-2	46.8	Resin-2	0.219	1.937	○
実施例8	HTM-3	45	ETM-2	46.8	Resin-2	0.255	1.935	○
実施例9	HTM-4	45	ETM-2	46.8	Resin-2	0.489	2.478	△
実施例10	HTM-5	45	ETM-2	46.8	Resin-2	0.487	2.487	△
実施例11	HTM-1	45	ETM-1	46.8	Resin-3	0.201	1.795	○
実施例12	HTM-2	45	ETM-1	46.8	Resin-3	0.201	1.876	○
実施例13	HTM-3	45	ETM-1	46.8	Resin-3	0.211	1.901	○
実施例14	HTM-4	45	ETM-1	46.8	Resin-3	0.442	2.213	△
実施例15	HTM-5	45	ETM-1	46.8	Resin-3	0.463	2.348	△
実施例16	HTM-1	35	ETM-1	44.2	Resin-3	0.199	1.801	○
実施例17	HTM-1	55	ETM-1	49.2	Resin-3	0.247	1.986	○
実施例18	HTM-1	65	ETM-1	51.4	Resin-3	0.421	2.581	△
実施例19	HTM-1	75	ETM-1	53.4	Resin-3	0.488	2.892	△
比較例1	HTM-1	45	ETM-1	46.8	Resin-4	0.641	3.652	×
比較例2	HTM-2	45	ETM-1	46.8	Resin-4	0.721	3.923	×
比較例3	HTM-3	45	ETM-1	46.8	Resin-4	0.751	3.745	×
比較例4	HTM-4	45	ETM-1	46.8	Resin-4	0.952	5.398	×
比較例5	HTM-6	45	ETM-1	46.8	Resin-4	1.106	7.002	×

【0077】表1より、導電性基材上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバイインダー樹脂からなる感光層を備え、前記バイインダー樹脂が、一般式

【1】または一般式【2】で示される線返し構造単位を有するポリカーボネート樹脂を含有した单層型感光体は、比較例に比べて、アイソパーH中に浸漬させても、電荷輸送剤の溶出量が少なく、且つ外観上の変化もほとんど無かった。

【0078】特に、一般式【5】で示されるホール輸送剤と一般式【6】で示される電子輸送剤との組み合わせ(実施例1～3、実施例6～8、実施例11～13)において、アイソパーH中の電荷輸送剤の溶出量が最小(ホール輸送剤溶出量 $0.25 \times 10^{-3}$ mol/l以下、電子輸送剤溶出量 $2 \times 10^{-3}$ mol/l以下)となり、耐溶媒性が最良であった。

【0079】また、図1には、アイソパーH中の電荷輸送剤溶出量と、全固形分濃度に対する全電荷輸送剤の固形分濃度との関係を示した(実施例11、16～19)。全電荷輸送剤の固形分濃度が50wt%を超えると(実施例18、19)、炭化水素系溶媒への電荷輸送剤溶出量が増加した(ホール輸送剤溶出量 $0.25 \times 10^{-3}$ mol/l以上、電子輸送剤溶出量 $2 \times 10^{-3}$ mol/l以上)。

mo l/1より大)。

【0080】以上の結果より、バイインダー樹脂の種類、電荷輸送剤の種類、電荷輸送剤の含有量が、感光体の耐溶媒性に大きな影響を及ぼすことが明らかとなつたが、最も影響が大きいパラメータは、請求項1または2記載のバイインダー樹脂の種類であった。

#### 【0081】

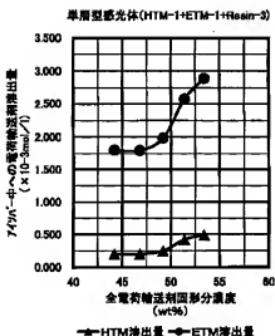
【発明の効果】導電性基材上に、少なくとも電荷発生剤と、電荷輸送剤を含有するバイインダー樹脂からなる感光層を備え、前記バイインダー樹脂が、一般式【1】または一般式【2】で示される線返し構造単位を有するポリカーボネート樹脂を含有した電子写真感光体が、炭化水素系溶媒への電荷輸送剤の溶出量が極めて少なく、且つ外観上の変化も無く、炭化水素系溶媒の現像溶液を用いた湿式現像方式の画像形成装置に使用することが可能である。

#### 【0082】

##### 【図面の簡単な説明】

【図1】アイソパーH中の電荷輸送剤溶出量と、全固形分濃度に対する全電荷輸送剤の固形分濃度との関係を示す図である。

【図1】



---

#### フロントページの続き

(72)発明者 本間 寿一

大阪市中央区玉造1丁目2番28号 京セラ

ミタ株式会社内

(72)発明者 屋島 亜矢子

大阪市中央区玉造1丁目2番28号 京セラ

ミタ株式会社内

(72)発明者 内田 真紀

大阪市中央区玉造1丁目2番28号 京セラ

ミタ株式会社内

(72)発明者 中村 恒一

大阪市中央区玉造1丁目2番28号 京セラ

ミタ株式会社内

(72)発明者 宮本 栄一

大阪市中央区玉造1丁目2番28号 京セラ

ミタ株式会社内

Fターム(参考) 2H068 AA13 AA19 AA20 AA31 BA13

BA14 BA38 BA63 BA64 BB20

BB26 BB53 FA01 FC08

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-116560

(43)Date of publication of application : 19.04.2002

---

(51)Int.Cl. G03G 5/05

G03G 5/06

---

(21)Application number : 2000-310967 (71)Applicant : KYOCERA MITA

CORP

(22)Date of filing : 11.10.2000 (72)Inventor : AZUMA JUN

SAKO HIROYUKI

WATANABE MASATADA

HONMA JUICHI

YASHIMA AYAKO

UCHIDA MASANORI

NAKAMURA KYOICHI

MIYAMOTO EIICHI

---

(54) ELECTROPHOTOGRAPHIC PHOTORECEPTOR USED IN IMAGE  
FORMING DEVICE ADOPTING WET DEVELOPING SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an electrophotographic photoreceptor having a practical sensitivity and excellent in solvent resistance even when immersed in a hydrocarbon solvent used for a developing solution in a wet image forming device, e.g. in an aliphatic hydrocarbon called Isoper or a paraffinic solvent.

SOLUTION: The electrophotographic photoreceptor has a photosensitive layer comprising a resin binder containing an electric charge generating agent and an

electric charge transferring agent on an electrically conductive substrate, the resin binder contains a polycarbonate resin comprising repeating structural units of formula [1] (where R10 and R11 are the same or different and each H or a 1-3C alkyl) or formula [2] and the photoreceptor is used in an image forming device adopting a wet developing system with a developing solution containing toner particles dispersed in a hydrocarbon solvent.

---

[Date of request for examination] 10.12.2001

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3583707

[Date of registration] 06.08.2004

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

\* NOTICES \*

JPO and INPIT are not responsible for any  
damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

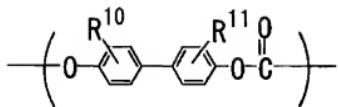
CLAIMS

---

[Claim(s)]

[Claim 1] the electrophotography photo conductor characterized by be use for  
the image formation equipment of a wet developing method using the  
development solution which it had the sensitization layer which consist of binder  
resin which contain a charge generating agent and a charge transportation  
agent at least on the conductive base, and said binder resin contained the  
polycarbonate resin which have the repetitive construct unit show by the general  
formula [1], and the toner particle distributed in the hydrocarbon system solvent.

General formula [1]: [Formula 1]

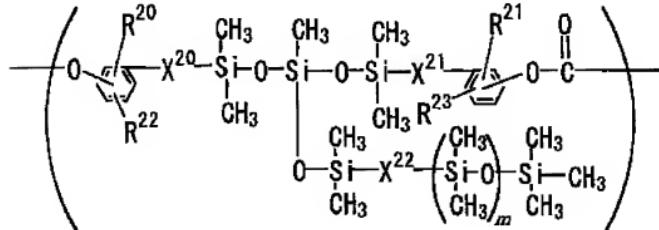


(the inside of a general formula [1], and R10 and R11 are the same -- or it differs

and a hydrogen atom or the alkyl group of carbon numbers 1-3 is shown.)

[Claim 2] the electrophotography photo conductor characterized by to be use for  
 the image formation equipment of a wet developing method using the  
 development solution which be equipped with the sensitization layer which  
 consist of binder resin which contain a charge generating agent and a charge  
 transportation agent at least on the conductive base, and contained the  
 polycarbonate resin which have the structural unit said binder resin be indicate  
 to be by the repetitive construct unit show by the general formula [1], and the  
 general formula [2], and a toner particle distributed in a hydrocarbon system  
 solvent

General formula [2]: [Formula 2]

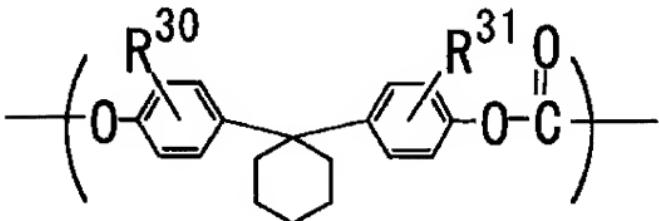


(the inside of a general formula [2], and X20, X21 and X22 are the same -- or it differs, and it is -(CH<sub>2</sub>)<sub>n</sub>, n shows the integer of 1-6, and R20, R21, R22, and R23 are the same -- or it differs, a hydrogen atom, a phenyl group, the alkyl group of carbon numbers 1-3, or an alkoxy group is shown, and m shows the numeric value of 0-200.)

[Claim 3] The electrophotography photo conductor according to claim 1 or 2 characterized by said binder resin containing the polycarbonate resin of the repetitive construct unit shown by the general formula [3] or the general formula [4].

General formula [3];

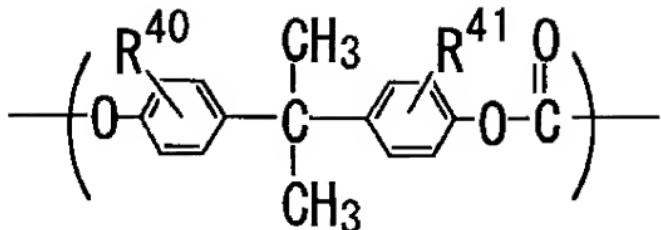
[Formula 3]



(the inside of a general formula [3], and R30 and R31 are the same -- or it differs and a hydrogen atom or the alkyl group of carbon numbers 1-3 is shown.)

General formula [4];

[Formula 4]



(the inside of a general formula [4], and R40 and R41 are the same -- or it differs and a hydrogen atom or the alkyl group of carbon numbers 1-3 is shown.)

[Claim 4] the repetitive construct unit shown by the general formula [1] to said binder resin total amount -- 10 - 50-mol% -- the electrophotography photo conductor according to claim 1 or 2 characterized by containing.

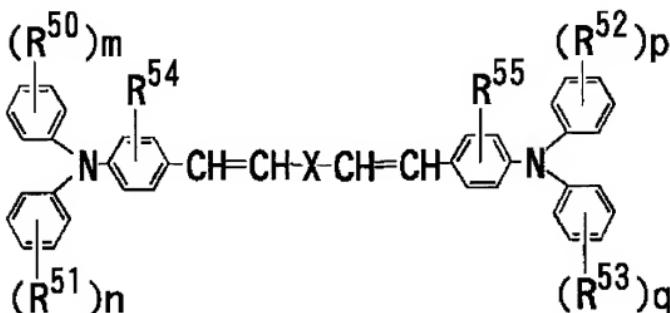
[Claim 5] the repetitive construct unit shown by the general formula [2] to said binder resin total amount -- 0.05 - ten-mol% -- the electrophotography photo conductor according to claim 2 characterized by containing.

[Claim 6] The electrophotography photo conductor according to claim 1 or 2 characterized by said sensitization layer being the monolayer mold which contains both a hole transportation agent and an electronic transportation agent as a charge generating agent and a charge transportation agent at least.

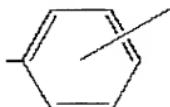
[Claim 7] Claims 1 or 2 which contain the hole transportation agent said charge transportation agent is indicated to be by the general formula [4], and are

characterized by the solid content concentration of said charge transportation agent being less than [ of total-solids concentration / 50wt% ], or the electrophotography photo conductor of six publications.

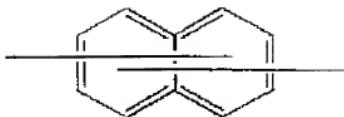
General formula [5]: [Formula 5]



the inside of a general formula [5], and R50, R51, R52 and R53 are the same -- or it differs, an alkyl group, an alkoxy group, an aryl group, an aralkyl radical, or a halogen atom is shown, and m, n, p, and q are the same -- or it differs and the integer of 0-3 is shown. R54 and R55 are the same -- or it differs and a hydrogen atom or an alkyl group is shown. Moreover, -X- is [Formula 6].



Or [Formula 7]



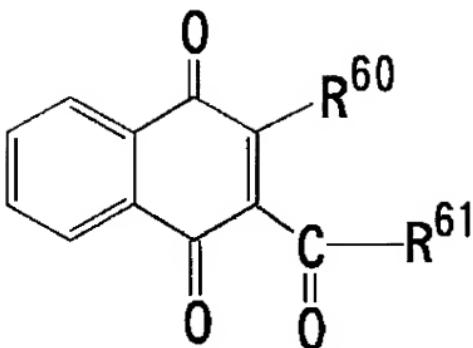
\*\*\*\*\*

[Claim 8] Claims 1 or 2 to which said charge generating agent is characterized by containing phthalocyanine pigment, or an electrophotography photo conductor given in six.

[Claim 9] The monolayer mold electrophotography photo conductor according to claim 6 with which AUW of the hole transportation agent in said charge transportation agent is characterized by being the AUW of an electronic transportation agent, and below equivalent.

[Claim 10] The monolayer mold electrophotography photo conductor according to claim 6 characterized by said electronic transportation agent containing the compound shown by the general formula [6].

General formula [6]: [Formula 8]



(R60 shows the alkyl group or aryl group which may have a halogen atom and a substituent among a general formula [6], and R61 shows alkyl group or aryl group, or radical:-O-R61a.) [ which may have a substituent ] R61a shows the alkyl group or aryl group which may have a substituent.

---

#### DETAILED DESCRIPTION

---

##### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the electrophotography photo conductor used for the image formation equipment of wet-developing methods,

such as an electrophotography type copying machine, facsimile, and a laser beam printer. It is related more with an organic photo conductor usable to the image formation equipment of the wet-developing method which the toner particle distributed in the hydrocarbon system solvent in the detail.

[0002]

[Description of the Prior Art] The electrophotography development method using the Carlsson process is divided roughly into a dry-developing method and a wet-developing method. the image formation equipment using a dry-developing method -- current [, such as a copying machine and a printer, ] -- although generally used widely, the image formation equipment using a wet-developing method is developed and produced commercially for many years.

[0003] However, the image with which the image formation equipment using a wet-developing method is obtained since it is possible for the toner to be distributed in the hydrocarbon system solvent generally, and to set toner particle size to 1 micrometer or less serves as high definition very much. For this reason, with commercial-scene expansion of the full color printer by which high definition in recent years is called for, it is again brought into the limelight and development is furthered.

[0004] Since a hydrocarbon system solvent is used for the image formation equipment using a wet-developing method as a development solution as

mentioned above, it is immersed into said hydrocarbon system solvent in all or some of photo conductor drum. As a hydrocarbon system solvent, the aliphatic series system hydrocarbon called Isopar, a paraffin series solvent, etc. are mentioned, for example. And it is common that inorganic photo conductors with which a sensitization layer component is not eluted, such as a selenium and an amorphous silicon, are used into these hydrocarbon system solvents.

[0005] On the other hand, the organic photo conductor is used in recent years more widely than the aforementioned inorganic photo conductor from having the advantage that manufacture is easy compared with the conventional inorganic photo conductor, cost is cheap, and the alternative of photo conductor ingredients, such as a charge transportation agent, a charge generating agent, and binding resin, is various, the degree of freedom of a functional design is high, and there is no toxicity.

[0006] There is a laminating mold photo conductor which carried out the laminating of the monolayer mold photo conductor which distributed the charge transportation agent (a hole transportation agent or electronic transportation agent) in the same sensitization layer with the charge generating agent, and the charge generating layer containing a charge generating agent and the charge transportation layer containing a charge transportation agent among the organic photo conductors.

[0007] Especially, there are few interfaces between that the coat defect at the time of forming that structure is easy and manufacture is easy and a layer can be controlled and a layer, and the monolayer mold photo conductor is in the limelight by the ability improving an optical property etc.

[0008] said laminating mold photo conductor and a monolayer mold photo conductor -- positive/negative -- although it can be used for any electrification mold, it is in use that a laminating mold generally uses negative electrification and a monolayer mold by forward electrification for the reasons of the sequence of lamination, the property of a photo conductor component, etc.

[0009] For this reason, since a monolayer mold organic photo conductor is the same forward electrification mold when cost transposes the inorganic photo conductor currently used conventionally to the organic photo conductor which does not have toxicity at a low price, since it is usually used with a forward electrification mold, inorganic photo conductors currently generally used to the image formation equipment using said wet-developing method, such as a selenium and an amorphous silicon, become advantageous.

[00010]

[Problem(s) to be Solved by the Invention] Since it is immersed into a hydrocarbon system solvent in all or some of photo conductor drum as mentioned above when using a common organic photo conductor for the image

formation equipment using a wet-developing method, Appearance change of a cracking crack etc. occurs on a photo conductor front face, low-molecular-weight matter, such as a charge transportation agent (a hole transportation agent or electronic transportation agent), is eluted in a hydrocarbon system solvent, the phenomenon in which electrification falls or sensibility gets worse occurs, and a good image becomes is hard to be obtained.

[0011] Then, by using the organic photo conductor which gave the overcoat (surface protective layer) with thermosetting resin, such as silicon resin, melamine resin, and an epoxy resin, further for the front face of an organic photo conductor, the endurance (it is hereafter written as "solvent-proof nature") over the aliphatic series system hydrocarbon called above-mentioned Isopar and hydrocarbon system solvents, such as a paraffin series solvent, is discovered, and preventing the elution of a charge transportation agent is proposed. However, by giving an overcoat, sensibility gets worse remarkably and the big problem that a manufacturing cost becomes high newly arises.

[0012] Charge transportation ability is given to binder resin itself as an approach of on the other hand not giving an overcoat (charge transportation polymer), and although making solvent-proof nature discover zero or by making it decrease is proposed in the content of a charge transportation agent, the molecular design of a charge transportation polymer is very difficult, and far from the practical

speed as an electrophotography photo conductor.

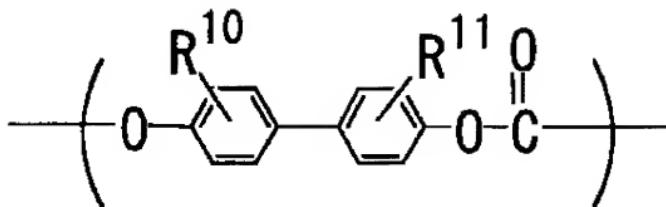
[0013] Then, the purpose of this invention is offering the electrophotography photo conductor which has "surpassing solvent-proof nature" (there being no appearance change on the front face of a photo conductor, and there being very little elution to the inside of the hydrocarbon system solvent of a charge transportation agent), and practical speed, even if it makes a hydrocarbon system solvent immersed without giving an overcoat.

[0014]

[Means for Solving the Problem] In order that this invention persons may attain the above-mentioned purpose wholeheartedly as a result of research, at least on a conductive base A charge generating agent, It has the sensitization layer which consists of binder resin containing a charge transportation agent. Said binder resin The electrophotography photo conductor containing the polycarbonate resin which has the repetitive construct unit shown by the general formula [1] or the general formula [2] Even if it used it for the image formation equipment of a wet-developing method using the development solution which the toner particle distributed in the hydrocarbon system solvent, it was very good, and the contained charge transportation agent (a hole transportation agent or electronic transportation agent) could not be easily eluted in the hydrocarbon system solvent, and solvent-proof nature found out the fact that a good image

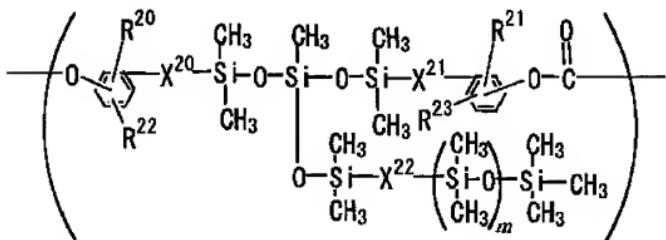
was obtained.

[0015] General formula [1]: [Formula 9]



(the inside of a general formula [1], and R10 and R11 are the same -- or it differs and a hydrogen atom or the alkyl group of carbon numbers 1-3 is shown.)

[0016] General formula [2]: [Formula 10]



(the inside of a general formula [2], and X20, X21 and X22 are the same -- or it differs, and it is -(CH<sub>2</sub>)<sub>n</sub>, n shows the integer of 1-6, and R20, R21, R22, and R23 are the same -- or it differs, a hydrogen atom, a phenyl group, the alkyl group of carbon numbers 1-3, or an alkoxy group is shown, and m shows the

numeric value of 0-200.)

[Detailed description]

[00017]

[An operation of this invention] the electrophotography photo conductor of this invention be use for the wet image formation equipment using the development solution which the toner particle distributed in the hydrocarbon system solvent, and it have the sensitization layer which consist of binder resin which contain a charge generating agent and a charge transportation agent at least on a conductive base, and be characterize by for said binder resin to contain the polycarbonate resin of the repetitive construct unit show by the general formula [1] or the general formula [2].

[0018] Its oil repellency to said hydrocarbon system solvent is also high while the polycarbonate resin which has the repetitive construct unit shown by the general formula [1] or the general formula [2] is refractory to the above-mentioned hydrocarbon system solvent. Consequently, the interaction of a sensitization layer front face and said hydrocarbon system solvent becomes small, there is no appearance change of a sensitization layer front face, and it is surmised that a charge transportation agent stops being eluted in said hydrocarbon system solvent easily.

[0019]

[Embodiment of the Invention] The electrophotography photo conductor of this invention is used for the wet image formation equipment using the aliphatic series system hydrocarbon called Isopar and hydrocarbon system solvents, such as a paraffin series solvent. At least A charge generating agent, It has the sensitization layer which consists of binder resin containing a charge transportation agent. Said binder resin As long as the polycarbonate resin of the repetitive construct unit shown by the general formula [1] or the general formula [2] is contained You may be the photo conductor of arbitration, and may be the monolayer mold photo conductor which contains a charge generating agent and a charge transportation agent in a single sensitization layer, and may be the laminating mold photo conductor which carried out the laminating of a charge generating layer and the charge transportation layer.

[0020] As mentioned above, as for the electrophotography photo conductor of this invention, in the case of a monolayer mold, it is desirable to use together a hole transportation agent and an electronic transportation agent as a charge transportation agent, but since the mobility of an electronic transportation agent is smaller than the mobility of a hole transportation agent, it is usually desirable to use it with a forward electrification mold. Moreover, in the case of a laminating mold, it is desirable to use it with the negative band electrotyping which carried out the laminating of the charge transportation layer which contained the hole

transportation agent on the charge generating layer at the same reason.

[0021] [Binder resin] The binder resin according to claim 1 or 2 used for the electrophotography photo conductor of this invention like contains the polycarbonate resin of the repetitive construct unit shown by the general formula [1] or the general formula [2].

[0022] Moreover, the binder resin used for the electrophotography photo conductor of this invention can use for others the various resin currently used for the sensitization layer from the former that what is necessary is just to contain said polycarbonate resin at least.

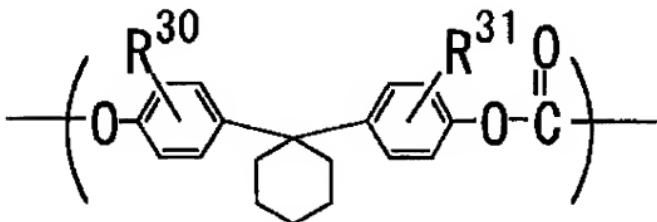
[0023] For example, a bisphenol Z mold, a bisphenol ZC mold, a bisphenol C mold, Polycarbonate resin, such as the bisphenol A mold, and polyarylate resin are begun. A styrene-butadiene copolymer, a styrene acrylonitrile copolymer, A styrene-maleic-acid copolymer, an acrylic copolymer, a styrene-acrylic-acid copolymer, Polyethylene, an ethylene-vinylacetate copolymer, chlorinated polyethylene, A polyvinyl chloride, polypropylene, an ionomer, a vinyl chloride vinyl acetate copolymer, Alkyd resin, a polyamide, polyurethane, polysulfone, diallyl phthalate resin, Thermoplastics, such as ketone resin, polyvinyl butyral resin, and polyether resin, Resin, such as photo-curing mold resin, such as silicone resin, an epoxy resin, phenol resin, a urea-resin, melamine resin, other thermosetting resin of cross-linking, epoxy acrylate, and urethane-acrylate, is

usable.

[0024] When it contains the polycarbonate resin which has the repetitive construct unit according to claim 3 said binder resin is indicated to be by the general formula [1] or the general formula [2] like, and the repetitive construct unit shown by the general formula [3] or the general formula [4], it is effective in the solvent-proof nature of a photo conductor, or the improvement in sensibility especially.

[0025] General formula [3];

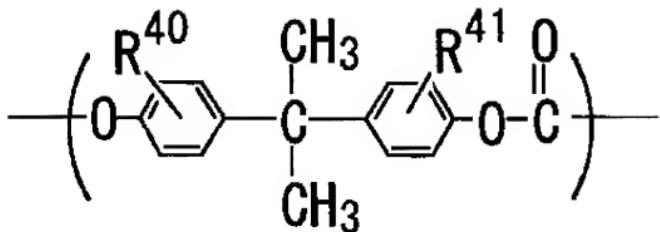
[Formula 11]



(the inside of a general formula [3], and R<sub>30</sub> and R<sub>31</sub> are the same -- or it differs and a hydrogen atom or the alkyl group of carbon numbers 1-3 is shown.)

[0026] General formula [4];

[Formula 12]



(the inside of a general formula [4], and R40 and R41 are the same -- or it differs and a hydrogen atom or the alkyl group of carbon numbers 1-3 is shown.)

[0027] Although the polycarbonate resin which has the repetitive construct unit shown by the general formula [1] or the general formula [2] is excellent in solvent-proof nature to a hydrocarbon system solvent as mentioned above since it is poorly soluble, it is inferior to compatibility with a charge transportation agent. On the other hand, the polycarbonate resin which has the repetitive construct unit shown by the general formula [3] or the general formula [4] has good compatibility with a charge transportation agent. For this reason, by using the polycarbonate resin which has the repetitive construct unit shown by the general formula [1] or the general formula [2], and the polycarbonate resin of the repetitive construct unit shown by the general formula [3] or the general formula [4], it becomes easy to carry out molecular dispersion of the charge transportation agent into binder resin, and it is considered that the solvent-proof nature or sensibility of a photo conductor improves for the following reason.

[0028] As mentioned above, although a charge transportation agent is carrying out the homogeneity dissolution and is usually carrying out molecular dispersion into binder resin as a reason the compatibility of binder resin and a charge transportation agent has big effect on solvent-proof nature or sensibility If the compatibility of binder resin and a charge transportation agent is bad, while the interaction of a binder pitch child and a charge transportation agent molecule will become weak, a charge transportation agent molecule will become easy to be eluted in a hydrocarbon system solvent and solvent-proof nature will fall It becomes easy to condense a charge transportation agent molecule, the transfer effectiveness of a charge falls, and it is surmised that sensibility gets worse.

[0029] It is desirable to make a hole transportation agent and an electronic transportation agent use together and contain as a charge transportation agent in a monolayer mold photo conductor especially, and the content ratio of a charge transportation agent total amount to binder resin becomes large. Furthermore, in the same sensitization layer as a charge transportation agent, a charge generating agent also carries out particle distribution, and exists. That is, in a monolayer mold photo conductor, it compares with a laminating mold photo conductor, and there are many ingredients which are distributing or dissolving into binder resin, and especially the effect the compatibility of binder resin and a charge transportation agent affects the solvent-proof nature or sensibility of a

photo conductor becomes very large.

[0030] moreover, the repetitive construct unit the repetitive construct unit according to claim 4 or 5 shown by the general formula [1] to a binder resin total amount like is indicated to be by 10 - 50-mol % and a general formula [2] – 0.05 - ten-mol% -- containing is desirable. If the content of the repetitive construct unit shown by the general formula [1] increases more than 50-mol%, when compatibility with a charge transportation agent will fall as mentioned above, solvent-proof nature and sensibility get worse, and when fewer than ten-mol%, there is an inclination for solvent-proof nature to get worse. Moreover, if the content of the repetitive construct unit shown by the general formula [2] increases more than ten-mol%, the solvent-proof nature and sensibility of a photo conductor will worsen for the same reason as the above, and when fewer than 0.05-mol%, it is in the inclination for solvent-proof nature to get worse.

[0031] Independent or two sorts or more can be used for the above-mentioned binder resin, blending or copolymerizing. As for the weight average molecular weight of the binder resin used for the electrophotography photo conductor of this invention, 10,000-400,000, and also 30,000-200,000 are desirable.

[0032] As a charge generating agent used for the electrophotography photo conductor of [charge generating agent] this invention For example, phthalocyanine pigment, such as a non-metal phthalocyanine and

oxo-titanylphthalocyanine, A perylene system pigment, a bis-azo pigment, a JIOKETO pyrrolo pyrrole pigment, a non-metal naphthalocyanine pigment, A metal naphthalocyanine pigment, a SUKUA line pigment, a tris azo pigment, an indigo pigment, An AZURENIUMU pigment, a cyanine pigment, a pyrylium pigment, an anthanthrone pigment, A triphenylmethane color system pigment, the Indanthrene pigment, a toluidine system pigment, a pyrazoline system pigment, Conventionally well-known charge generating agents, such as an organic photo conductor called the Quinacridone system pigment and inorganic photoconduction ingredients, such as a selenium and selenium-tellurium, a selenium-arsenic, a cadmium sulfide, and an amorphous silicon, are mentioned.

[0033] The charge generating agent of the above-mentioned instantiation can blend and use independent or two sorts or more so that it may have absorption wavelength to a desired field.

[0034] Since the photo conductor which has sensibility is needed for a wavelength field 700nm or more, phtalo SHININ system pigments, such as a non-metal phthalocyanine and oxo-titanylphthalocyanine, are suitably used for the image formation equipment of digital optical system, such as a laser beam printer and facsimile, which used especially the light sources, such as semiconductor laser, among the charge generating agents of the above-mentioned instantiation like claim 8 publication. In addition, it is not limited

especially about the crystal mold of the above-mentioned phthalocyanine pigment, but various things can be used.

[0035] the case of a monolayer mold photo conductor -- a charge generating agent -- total binder resin weight -- receiving -- 0.1 - 50wt%, and further 0.5 - 30wt % -- it is desirable to make it contain. the case of a laminating mold photo conductor -- 1 - 500wt%, and further 10 - 300wt % -- it is desirable to make it contain.

[0036] The charge transportation agent used for the electrophotography photo conductor of [charge transportation agent] this invention can use a well-known electronic transportation agent or a hole transportation agent conventionally. Especially in the case of a monolayer mold photo conductor, it is desirable to make an electronic transportation agent and a hole transportation agent blend and contain in a sensitization layer.

[0037] As an usable hole transportation agent, to the electrophotography photo conductor of <hole transportation agent> this invention For example, N, N, N', an N'- tetra-phenyl benzidine derivative, N and N, N', N'-tetra-phenyl phenylenediamine derivative, N, N, N', an N'- tetra-phenyl naphthylene diamine derivative, N and N, N', N'-tetra-phenyl phenan tolylenediamine derivative, 2, 5-JI (4-methylamino phenyl) - Oxadiazole system compounds, such as 1, 3, and 4-oxadiazole, Styryl system compounds, such as 9-(4-diethylaminostyryl)

anthracene, Carbazole system compounds, such as a polyvinyl carbazole, an organic polysilane compound, Pyrazoline system compounds, such as 1-phenyl-3-(p-dimethylaminophenyl) pyrazoline, A hydrazone system compound, the Indore system compound, an oxazole system compound, Nitrogen ring type compounds, such as an isoxazole system compound, a thiazole system compound, a thiadiazole system compound, an imidazole system compound, a pyrazole system compound, and a triazole compound, and a condensed multi-ring type compound are mentioned.

[0038] In this invention, a hole transportation agent uses only one sort, and also may blend and use two or more sorts.

[0039] As an usable electronic transportation agent, to the electrophotography photo conductor of <electronic transportation agent> this invention An anthraquinone derivative besides a diphenoquinone derivative and a benzoquinone derivative, A MARONO nitril derivative, a thiopyran derivative, a trinitro thioxan ton derivative, 3, 4, 5, and 7-tetra-nitroglycerine-9-full -- me -- non -- a derivative and a dinitro anthracene derivative -- A dinitro acridine derivative, a nitro ANTOARA quinone derivative, a dinitro anthraquinone derivative, Tetracyanoethylene, 2 and 4, a 8-trinitro thioxan ton, a dinitrobenzene, The various compounds which have electronic receptiveness, such as a dinitro anthracene, a dinitro acridine, nitro anthraquinone, dinitro anthraquinone, a

succinic anhydride, a maleic anhydride, and a dibromo maleic anhydride, are mentioned.

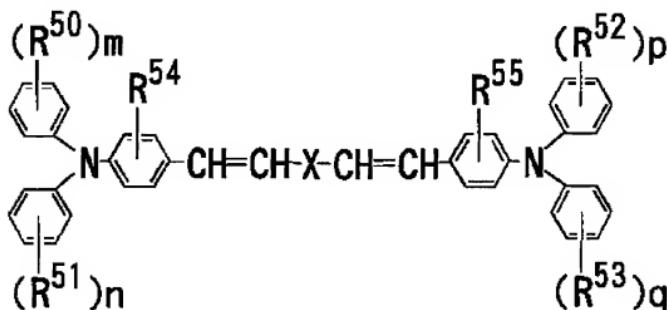
[0040] In this invention, an electronic transportation agent uses only one sort, and also may blend and use two or more sorts.

[0041] Since the rate of the charge transportation agent which exists near the photo conductor front face also becomes high although it becomes good [ the photosensitivity of a photo conductor ] so that there are generally many contents of a charge transportation agent, it is used as a developer, and into the hydrocarbon system solvent immersed in all or some of photo conductor drum, a charge transportation agent becomes easy to be eluted and solvent-proof nature falls. Although photosensitivity gets worse on the contrary so that there are few contents of a charge transportation agent, solvent-proof nature improves. For this reason, a thing [ making solid content concentration of all charge transportation agents into less than / 50wt% / of total-solids concentration ] according to claim 7 is [ like ] desirable.

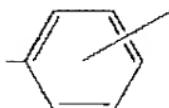
[0042] As a hole transportation agent, since mobility is large, photosensitivity sufficient also with a comparatively small content discovers especially the stilbene system derivative shown by the general formula [5] according to claim 7. That is, by making into less than [ of total-solids concentration / 50wt% ] solid content concentration of the charge transportation agent containing the hole

transportation agent shown by the general formula [5], there is very little elution to the inside of said hydrocarbon system solvent, and the photo conductor which has photosensitivity without a real use top problem can obtain.

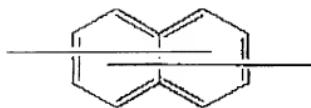
[0043] General formula [5]: [Formula 13]



the inside of a general formula [5], and R50, R51, R52 and R53 are the same -- or it differs, an alkyl group, an alkoxy group, an aryl group, an aralkyl radical, or a halogen atom is shown, and m, n, p, and q are the same -- or it differs and the integer of 0-3 is shown. R54 and R55 are the same -- or it differs and a hydrogen atom or an alkyl group is shown. Moreover, -X- is [Formula 14].



Or [Formula 15]

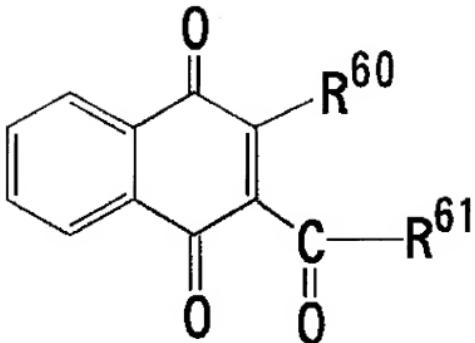


\*\*\*\*\*

[0044] On the other hand, if it restricts in the case of a monolayer mold photo conductor, a thing [ that it is below equivalent / of the content of an electronic transportation agent ] according to claim 9 is [ like ] desirable [ the content of a hole transportation agent ]. As for this, a hole transportation agent and an electronic transportation agent form a charge transportation complex (CT complex) in many cases, CT complex is refractory to said hydrocarbon system solvent, and the surplus hole transportation agent which does not form CT complex is considered because it is easy to be eluted in a hydrocarbon system solvent.

[0045] The compound especially shown by the general formula [6] according to claim 10 as an electronic transportation agent is used suitably. This is a combination in which the electronic transportation agent shown by the hole transportation agent shown by the general formula [5] and the general formula [6] tends to form CT complex, and this CT complex is guessed because it is refractory to a hydrocarbon system solvent as mentioned above.

[0046] General formula [6]: [Formula 16]



(R60 shows the alkyl group or aryl group which may have a halogen atom and a substituent among a general formula [6], and R61 shows alkyl group or aryl group, or radical:-O-R61a.) [ which may have a substituent ] R61a shows the alkyl group or aryl group which may have a substituent.

[0047] As mentioned above, the electronic transportation agent shown as a charge transportation agent by the hole transportation agent shown by the general formula [5] and the general formula [6] is contained, and when the solid content concentration of said charge transportation agent is less than [ of total-solids concentration / 50wt% ] and the AUW of said hole transportation agent is the AUW of said electronic transportation agent, and below equivalent, the monolayer mold photo conductor which solvent-proof nature is the highest and has high sensitivity can be obtained.

[0048] In the case of a monolayer mold photo conductor, sensitization layer

membrane thickness has 5-100 micrometers and desirable about further 10-50 micrometers. In the case of a laminating mold photo conductor, 0.01-5 micrometers of thickness of a charge generating layer and further 0.1-3 micrometers are desirable, and the thickness of a charge transportation layer has 2-100 micrometers and desirable about further 5-50 micrometers.

[0049] Degradation inhibitors, such as well-known various additives, for example, an anti-oxidant, a radical supplement agent, a singlet quencher, and an ultraviolet ray absorbent, a softener, a plasticizer, a surface treatment agent, an extending agent, a thickener, a distributed stabilizer, a wax, an acceptor, a donor, etc. can be conventionally blended with a sensitization layer in the range which does not have a bad influence on the electrophotographic properties other than each above-mentioned component. Moreover, in order to raise the sensibility of a sensitization layer, well-known sensitizers, such as a terphenyl, halo naphthoquinones, and an acenaphthylene, may be used together with a charge generating agent.

[0050] Between the base material, the sensitization layer, or the layer by which the laminating was carried out, the barrier layer may be formed in the range which does not check the property of a photo conductor.

[0051] The glass covered with the plastic material which could use the various ingredients which have conductivity as a base material with which a sensitization

layer is formed, for example, metal simple substances, such as iron, aluminum, copper, tin, platinum, silver, vanadium, molybdenum, chromium, cadmium, titanium, nickel, palladium, an indium, stainless steel, and brass, and the above-mentioned metal vapor-deposited or laminated, an aluminium iodide, the tin oxide, indium oxide, etc. is raised.

[0052] According to the structure of the image formation equipment which uses the configuration of a base material, you may be any, such as the shape of the shape of a sheet, and a drum, and the base material itself has conductivity, or the front face of a base material should just have conductivity. Moreover, as for a base material, what has sufficient mechanical strength on the occasion of use is desirable.

[0053] What is necessary is to carry out distributed mixing of the charge generating agent of said instantiation, a charge transportation agent, the binder resin, etc. with a suitable solvent using a well-known approach, for example, a roll mill, a ball mill, attritor, a paint shaker, an ultrasonic disperser, etc., to adjust dispersion liquid, to apply this with a well-known means and just to dry it, in forming by the approach of spreading of a sensitization layer.

[0054] As a solvent for producing the above-mentioned dispersion liquid, various organic solvents are usable. For example, alcohols, such as a methanol, ethanol, isopropanol, and a butanol, Aliphatic series system hydrocarbons, such as

n-hexane, an octane, and a cyclohexane, benzene, Aromatic series system hydrocarbons, such as toluene and a xylene, dichloromethane, a dichloroethane, Halogenated hydrocarbon, such as chloroform, a carbon tetrachloride, and a chlorobenzene, Wood ether, diethylether, a tetrahydrofuran, ethylene glycol wood ether, Ester, such as ketones, such as ether, such as diethylene-glycol wood ether, an acetone, a methyl ethyl ketone, and a cyclohexanone, ethyl acetate, and methyl acetate, dimethyl formaldehyde, dimethylformamide, dimethyl sulfoxide, etc. are raised. These solvents are independent, or two or more sorts are mixed and they are used.

[0055] Furthermore, in order to improve dispersibility, such as a charge generating agent and a charge transportation agent, and smooth nature of a sensitization layer front face, a surface active agent, a leveling agent, etc. may be used.

[0056]

[Embodiment of the Invention] Hereafter, an example and the example of a comparison are given and this invention is explained. In addition, the following operation gestalten are examples which materialized this invention, and do not limit the technical range of this invention.

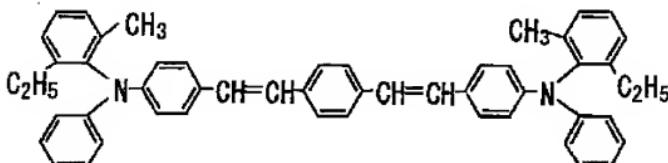
[0057] As a [examples 1-19] charge generating agent, the X type non-metal phthalocyanine 3.5 weight section, One sort chosen from HTM-1-5 as a hole

transportation agent (35 - 75 weight section), One sort (55 weight sections) chosen from ETM-1 and -2 as an electronic transportation agent, and the repetitive construct unit shown as binder resin by the general formula [1] or general formula [2] of weight average molecular weight 100,000, The copolymerization polycarbonate resin (Resin-1-3) 110 weight section of a bisphenol Z mold polycarbonate or the bisphenol A mold polycarbonate It was made to distribute or dissolve in a ball mill with the tetrahydrofuran 400 weight section for 24 hours, and the coating liquid for monolayer mold sensitization layers was produced (charge transportation agent solid-content concentration to total-solids concentration: 44.2 - 53.4wt%).

[0058] As [examples 1-5 of comparison] binder resin, the coating liquid for monolayer mold photo conductors was produced like the example except having used the bisphenol Z mold polycarbonate resin (Resin-4) of weight average molecular weight 100,000.

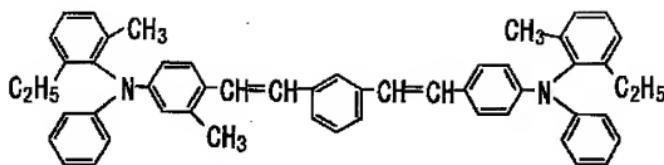
[0059] [HTM-1]

[Formula 17]



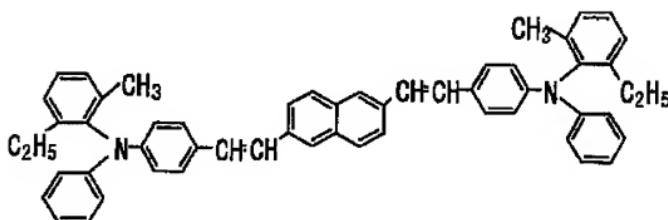
[0060] [HTM-2]

[Formula 18]



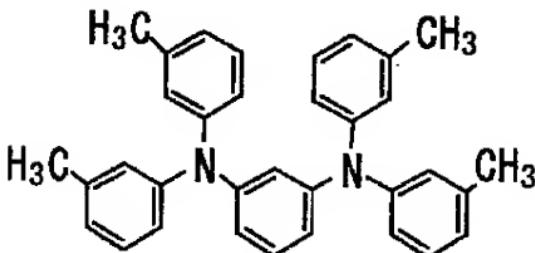
[0061] [HTM-3]

[Formula 19]



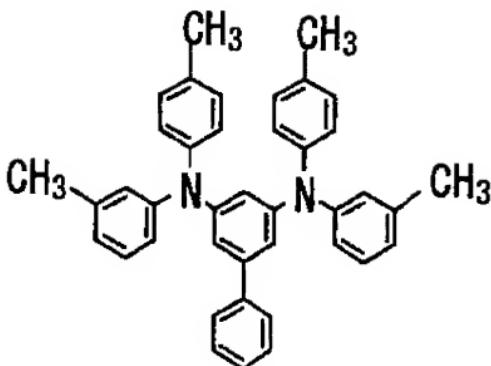
[0062] [HTM-4]

[Formula 20]



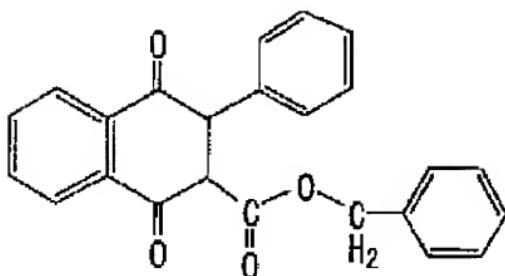
[0063] [HTM-5]

[Formula 21]



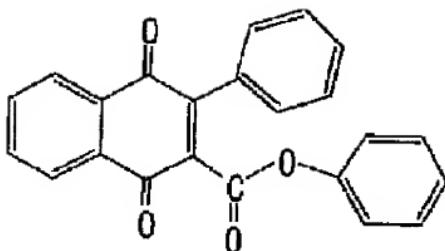
[0064] [ETM-1]

[Formula 22]



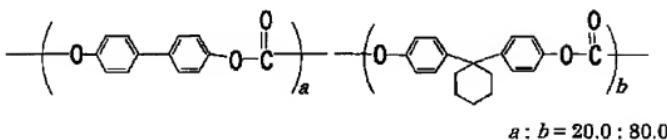
[0065] [ETM-2]

[Formula 23]



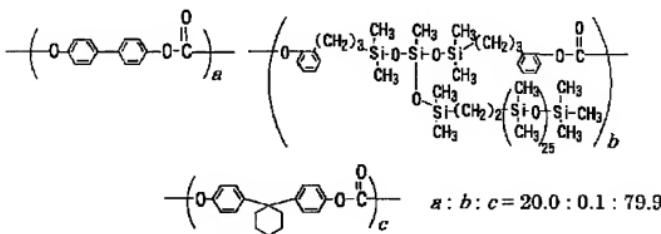
[0066] [Resin-1]

[Formula 24]



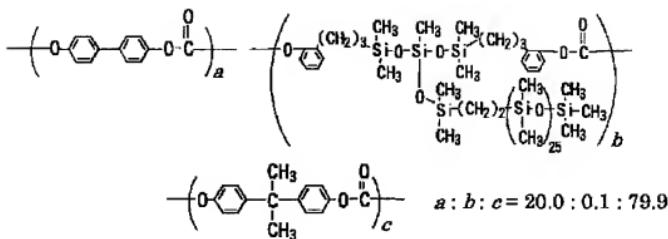
[0067] [Resin-2]

[Formula 25]



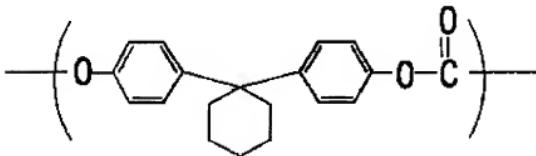
[0068] [Resin-3]

[Formula 26]



[0069] [Resin-4]

[Formula 27]



[0070] Solvent-proof nature was evaluated by the following trial about the photo

conductor of each above-mentioned example and the example of a comparison.

[0071] The coating liquid obtained in the <solvent-proof sex-test> example and

the example of a comparison was used, the monolayer mold sensitization layer

of 25 micrometers of thickness was produced on the aluminum vacuum

evaporationo sheet (125 degrees C of heat treatment conditions, 35 minutes),

and the 5cmx5cm test piece was obtained. Next, the above-mentioned test piece was made immersed for one week at a dark place and 50 degrees C in a sealing system into 100g Isopar H (aliphatic series system hydrocarbon used for the developer of wet image formation equipment). On the other hand, the forcible dissolution of a hole transportation agent and the electronic transportation agent was carried out into Isopar H by predetermined concentration, and the concentration-absorbance calibration curve in the peak wavelength of said hole transportation agent and an electronic transportation agent was produced by UV measurement. And UV measurement of Isopar H immersed in the test piece was performed, and the elution volume was computed using said calibration curve from the absorbance in the peak wavelength of a hole transportation agent and an electronic transportation agent. The solvent-proof nature of a photo conductor is so high that there are few elution volumes.

[0072] About the hole transportation agent elution volume, 0.5x10 to 3 mol/l less thanl. was made good [ 3x10 to 3 or less mol/l ] about good and an electronic transportation agent elution volume. About 0.25x10 to 3 or less mol/l, and especially an electronic transportation agent elution volume, 2x10 to 3 mol/l less thanl. is [ elution volume / hole transportation agent ] desirable.

[0073] After the appearance change on the front face of a photo conductor made

Isopar H immersed for three weeks in 50 degrees C and a dark place and took out the above-mentioned test piece, it made Isopar H season naturally and observed the photo conductor front face by viewing.

[0074] The case where a cracking crack generated the case where O and some cracking cracks generate the case where there is no change in a sensitization layer front face, all over \*\* and a test piece was made into x. In addition, since the severe immersion test is estimating appearance change, even if said evaluation is \*\*, if it is used for the wet image formation equipment with which some photo conductor drums are immersed in the development solution for example, there will be no problem on real use.

[0075] The above-mentioned evaluation test result was shown in Table 1.

[0076]

[Table 1]

ホール輸送剤 種類	ホール輸送剤 合計量(重量部)	電子輸送剤 種類(55重量部)	電荷輸送剤別 分率(%)	バイNDER-数量 種類	HTM溶出量 $\times 10^{-3} \text{mol}/\text{L}$	ETM溶出量 $\times 10^{-3} \text{mol}/\text{L}$	露光体表面 外観変化
実施例1	HTM-1 45	ETM-1 45.8		Resin-1 0.203	1.995	1.901	○
実施例2	HTM-2 45	ETM-1 45.8		Resin-1 0.205	1.901	1.835	○
実施例3	HTM-3 45	ETM-1 45.8		Resin-1 0.233	1.523	2.358	△
実施例4	HTM-4 45	ETM-1 45.8		Resin-1 0.465	0.483	2.596	△
実施例5	HTM-5 45	ETM-1 45.8		Resin-1 0.483	2.596	1.796	○
実施例6	HTM-1 45	ETM-2 45.8		Resin-2 0.212	1.544	1.937	○
実施例7	HTM-2 45	ETM-2 45.8		Resin-2 0.219	1.835	2.479	△
実施例8	HTM-3 45	ETM-2 45.8		Resin-2 0.255	1.835	2.487	△
実施例9	HTM-4 45	ETM-2 45.8		Resin-2 0.489	0.201	1.796	○
実施例10	HTM-5 45	ETM-2 45.8		Resin-2 0.487	2.213	1.876	○
実施例11	HTM-1 45	ETM-1 45.8		Resin-3 0.203	0.442	0.463	△
実施例12	HTM-2 45	ETM-1 45.8		Resin-3 0.211	1.901	2.348	△
実施例13	HTM-3 45	ETM-1 45.8		Resin-3 0.442	1.801	1.995	○
実施例14	HTM-4 45	ETM-1 45.8		Resin-3 0.442	1.886	1.995	○
実施例15	HTM-5 45	ETM-1 45.8		Resin-3 0.421	2.581	2.892	△
実施例16	HTM-1 35	ETM-1 45.8		Resin-3 0.448	3.652	3.745	×
実施例17	HTM-1 55	ETM-1 45.8		Resin-3 0.247	3.745	5.398	×
実施例18	HTM-1 65	ETM-1 51.4		Resin-3 0.421	3.745	5.398	×
実施例19	HTM-1 75	ETM-1 53.4		Resin-3 0.448	3.745	5.398	×
比較例1	HTM-1 45	ETM-1 45.8		Resin-4 0.541	3.745	3.745	×
比較例2	HTM-2 45	ETM-1 45.8		Resin-4 0.721	3.745	3.745	×
比較例3	HTM-3 45	ETM-1 45.8		Resin-4 0.751	3.745	3.745	×
比較例4	HTM-4 45	ETM-1 45.8		Resin-4 0.852	3.745	3.745	×
比較例5	HTM-5 45	ETM-1 45.8		Resin-4 1.106	3.745	3.745	×

[0077] From Table 1, it had the sensitization layer which consists of binder resin which contains a charge generating agent and a charge transportation agent at least on the conductive base, and even if it made the monolayer mold photo conductor with which said binder resin contained the polycarbonate resin which has the repetitive construct unit show by the general formula [1] or the general formula [2] immerse into Isopar H compared with the example of a comparison, the elution volume of a charge transportation agent did not have most exterior change few.

[0078] In combination (examples 1-3, examples 6-8, examples 11-13) with the electronic transportation agent shown by the hole transportation agent especially

shown by the general formula [5], and the general formula [6], the elution volume of the charge transportation agent to the inside of Isopar H became min (0.25x10 to 3 or less mol/l of hole transportation agent elution volumes, 2x10 to 3 mol/l. [ less than ] electronic transportation agent elution volume), and solvent-proof nature was best.

[0079] Moreover, the relation between the charge transportation agent elution volume to the inside of Isopar H and the solid content concentration of all the charge transportation agents to total-solids concentration was shown in drawing 1 (examples 11, 16-19). When the solid content concentration of all charge transportation agents exceeded 50wt(s)% (examples 18 and 19), the charge transportation agent elution volume to the inside of a hydrocarbon system solvent increased (it is size in hole transportation agent elution volume 0.25x10-3 mol/l from size and a 2x10 to 3 mol/l. electronic transportation agent elution volume).

[0080] Although it became clear from the above result that the class of binder resin, the class of charge transportation agent, and the content of a charge transportation agent do the big effect to the solvent-proof nature of a photo conductor, the parameter with the largest effect was the class of binder resin according to claim 1 or 2.

[0081]

[Effect of the Invention] On a conductive base, it has the sensitization layer which consists of binder resin which contains a charge generating agent and a charge transportation agent at least. The electrophotography photo conductor with which said binder resin contained the polycarbonate resin which has the repetitive construct unit shown by the general formula [1] or the general formula [2] It is able for an exterior change not to have the elution volume of the charge transportation agent to a hydrocarbon system solvent, either, and to use it for the image formation equipment of a wet-developing method using the development solution of a hydrocarbon system solvent very few.

[0082]

---

#### DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the relation between the charge transportation agent elution volume to the inside of Isopar H, and the solid content concentration of all the charge transportation agents to total-solids concentration.